

### **REMARKS**

The present amendment is in response to the Office Action, dated September 26, 2002, where the Examiner has rejected claims 1-20. By the present amendment and response, claims 1, 9 and 15-17 have been amended to overcome the Examiner's rejections. Reconsideration and allowance of pending claims 1-20 in view of the following remarks are respectfully requested.

#### **A. Objection to Claims 9 and 15-16 due to Informalities**

The Examiner has objected to claims 9 and 15-16 because of informalities. To overcome these objections, Applicants have amended claims 9 and 15-16 to correct these informalities.

#### **B. Rejection of Claim 7 under 35 U.S.C. § 103(a)**

The Examiner has rejected claims 1-3, 5-11, 13-14 and 17-20 under 35 USC §103(a) as being unpatentable over **Figures 1a-3b** of the present application ("**Figures 1a-3b**") in view of **Iyer et al.** (US patent 6,121,133) ("**Iyer '133**"). Although Applicants respectfully disagree with the Examiner's rejection, in order to expedite allowance of the present application, Applicants have amended independent claims 1, 9 and 17 in response to the Examiner's rejection. For the reasons discussed below, Applicants respectfully submit that amended independent claims 1, 9 and 17 and dependent claims 2-8, 10-16 and 18-20, are patentably distinguishable over **Figures 1a-3b** in view of **Iyer '133**.

Pending claim 1 is directed to a semiconductor workpiece having improved integrity of photoresist patterns and metallic microelectronic structures. As recited in

amended independent claim 1, the semiconductor workpiece includes, among other things, “a metal layer and an inorganic dielectric ARC layer disposed on the metal layer, wherein said inorganic dielectric ARC layer functions as a hard mask.” The inorganic dielectric ARC layer functions as a hard mask, which reduces erosion of metallic microelectronic structures during metal etching. Thus, the inorganic dielectric ARC layer enhances the integrity of these metallic microelectronic structures.

With regard to independent claim 1, **Figures 1a-3b** fail to disclose, teach or suggest the above recited limitations specified by claim 1. **Figures 1a-3b** disclose a metal stack 302 comprising a metal layer 314, an organic ARC layer 312 and a barrier layer 316. The metal stack forms metallic microelectronic structures after a metal etching process. The organic ARC layer 312 of **Figures 1a-3b** comprises organic material. In contrast, amended claim 1 specifies a semiconductor workpiece having an inorganic dielectric ARC layer that functions as a hard mask.

The basic deficiencies of **Figures 1a-3b** are not remedied by the disclosure of **Iyer ‘133** because **Iyer ‘133** fails to disclose or suggest a device capable of functioning as a hard mask. **Iyer ‘133** discloses an oxidation diffusion barrier stack comprising a silicon wafer 200, a pad oxide layer 202, a first silicon nitride layer 226, an inorganic ARC layer 206 and a second silicon nitride layer 210. The oxidation diffusion barrier stack forms oxide deposits after an oxidation process. The oxidation diffusion barrier stack requires silicon nitride layers to act as a barrier to oxygen diffusion. The oxidation diffusion barrier stack of **Iyer ‘133** does not include a metal layer or a hard mask. In contrast,

amended claim 1 specifies a semiconductor workpiece having a metal layer and an inorganic dielectric ARC layer that functions as a hard mask.


Therefore, neither **Figures 1a-3b** nor **Iyer '133**, alone or in combination, result in amended independent claim 1 because **Figures 1a-3b** and **Iyer '133**, alone or in combination, fail to disclose or suggest a device that includes a metal layer and an inorganic dielectric ARC layer that functions as a hard mask. Accordingly, Applicants respectfully submit that rejection of claim 1 has been traversed, and that dependent claims 2-8 should now be allowed.

Furthermore, Applicants respectfully submit that there is no teaching or suggestion in the cited references to combine the metal stack of **Figures 1a-3b** with the oxidation diffusion barrier stack of **Iyer '133**. The Examiner states that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the workpiece of **Figures 1a-3b** with the inorganic ARC layer of **Iyer '133** to eliminate particle contamination. However, the Examiner does not indicate any particular art reference which suggests or motivates combining the teachings of the cited art or which shows how the combination is to be made. In order to use a combination of art references to show that an invention would have been obvious, there must be some suggestion in the art that the references should be combined.

Applicants submit that it would not have been obvious to one of ordinary skill in the art at the time the invention was made to combine the metal stack of **Figures 1a-3b** with the oxidation diffusion barrier stack of **Iyer '133**. In the integrated circuit ("IC")

fabrication art, metal stacks form metallic microelectronic structures after a metal etching process, whereas oxidation diffusion barrier stacks form oxide deposits after an oxidation process. As is known in the IC fabrication art, metal etching and oxidation processes are separate processes. Thus, one of ordinary skill in the IC fabrication art would not have thought to combine a metal stack with an oxidation diffusion barrier stack. Further, there is no teaching or suggestion in any of the cited references to combine the metal stack of **Figures 1a-3b** with the oxidation diffusion barrier stack of **Iyer '133**. Therefore, Applicants respectfully submit that it is improper to combine the metal stack of **Figures 1a-3b** with the oxidation diffusion barrier stack of **Iyer '133**.

Independent claims 9 and 17 have been amended to include all the limitations recited in amended independent claim 1. Thus, based on the reasons described above with regard to claim 1, independent claims 9 and 17 are patentable over **Figures 1a-3b** in view of **Iyer '133**. Pending claims 10-16 and 18-20 are allowable because they depend from claims 9 and 17, respectively, which are patentable over **Figures 1a-3b** in view of **Iyer '133**.

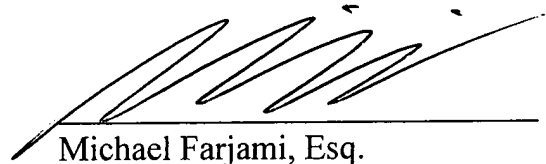


**C. Conclusion**

Based on the foregoing reasons, amended independent claims 1, 9 and 17 and claims depending therefrom, are patentably distinguishable over the art cited by the Examiner. Thus, claims 1-20 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early allowance of claims 1-20 pending in the present application is respectfully requested.

Respectfully Submitted,  
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**Version with Markings to Show Changes Made**

**In the Claims:**

**Claims 1, 9 and 15-17 have been amended as follows:**

1. (Once Amended) A semiconductor workpiece, comprising:

a metal layer;

an inorganic dielectric ARC layer disposed on the metal layer, wherein said

inorganic dielectric ARC layer functions as a hard mask; and

a photoresist layer disposed on the ARC layer opposite the metal layer.

9. (Once Amended) A metallic stack for a semiconductor interconnect,

comprising:

a metal layer;

an inorganic dielectric ARC layer disposed on the metal layer, wherein said

inorganic dielectric ARC layer functions as a hard mask; and

a barrier layer disposed on the metal layer opposite the [arc] ARC layer.

15. (Once Amended) The metallic stack recited in claim 9 wherein the stack is

about 1,000 to 20,000 [Angstrans] Angstroms thick.

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16. (Once Amended) The metallic stack recited in claim 15 wherein the stack is about 5,000 to [8.000 Amgstrans] 8,000 Angstroms thick.

17. (Once Amended) A semiconductor device, comprising:  
an oxide layer formed on a wafer; and  
at least one microelectronic structure extending from the [ovide] oxide layer and  
including:

a barrier layer disposed on the oxide layer;

a metal layer disposed on the barrier layer; and

an inorganic dielectric ARC layer disposed on the metal layer, wherein said inorganic dielectric ARC layer functions as a hard mask.